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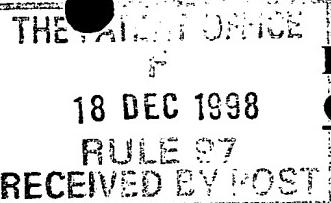
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**2. Patent application number**

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**9827940.9****3. Full name, address and postcode of the or of  
each applicant (underline all surnames)**Black & Decker Inc.  
Drummond Plaza Office Park  
1423 Kirkwood Highway  
Newark, Delaware  
USA

Patents ADP number (if you know it)

341214001

If the applicant is a corporate body, give the  
country/state of its incorporation

Delaware, USA

**4. Title of the invention****A POWER SAW****5. Name of your agent (if you have one)**

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7572555001

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Signature Date: 17 December 1998

DARRIN SHAYA

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**DUPPLICATE****A POWER SAW**

The present invention relates to a power saw and has particular, although not exclusive, relevance to such a 5 power saw which may be operated with a plurality of interchangeable saw blades.

Although the concept of using a power saw with a plurality of interchangeable blades has been known for many years, 10 there is a tendency for the blades which are interchanged to be of the same physical size. The only significant difference between the blades tends to be the nature of the saw teeth. For example teeth of differing pitches are used when sawing wood as opposed to metal.

15 It has, however, been found that it would be useful if a power saw could accept a plurality of different saw blades of differing sizes as well as of differing natures. Such a provision could enable the power saw to operate in totally 20 different sawing modes, depending upon which blades are used.

For example, if the power saw were able to accept a large 25 woodsawing blade (such as are used for cutting tree branches or wooden logs) and also a small jigsaw blade, then a truly versatile saw would be available. The saw could then be readily adapted to different sawing modes by the user simply changing the blades.

30 Although the above aim is highly desirable, there exist certain difficulties. For example, a large power saw (so-called 'panel saw') has fundamentally different characteristics to those of a jigsaw.

Panel saws tend to be large, heavy and bulky saws having high-powered motors. This is because in use of the saw, a large workpiece and a high amount of stock are worked upon. Also, a high degree of accuracy in the sawing process tends  
5 not to be necessary.

By contrast jigsaws tend to be relatively small, lightweight saws with smaller, often variable-speed, motors. Because the workpiece on which a jigsaw is used is usually small  
10 and/or thin, then smaller saw blades are used. Furthermore there is often the need for a high degree of accuracy when sawing with a jigsaw.

Additionally, the panel saw and jigsaw blades are usually  
15 held at different angles relative to a workpiece. A panel saw blade is often brought down into contact with a workpiece generally parallel therewith, whilst a jigsaw blade cuts into a workpiece from the side.

20 The above differences mean that a jigsaw will need to have a sole plate in order to guide the saw blade during cutting and also to enable the user of the jigsaw to maintain the attitude of the blade constant with respect to the workpiece. A panel saw, however, often needs no such sole  
25 plate.

It would thus be highly desirable for a saw capable of operating in a plurality of modes, such as a panel saw and a jigsaw, to have a sole plate when needed, but no sole plate  
30 when not needed.

Accordingly the present invention provides a body and a motor housed within the body; the motor arranged to power a reciprocable shaft on which a blade for sawing may be  
35 mounted; a pivotable sole plate attached to the body and

arranged to be held relative thereto in a plurality of positions such that in at least one position the sole plate acts as a guide for use of the power saw as a jigsaw with the blade for sawing passing through the sole plate in use 5 of the power saw as a jigsaw. By allowing the sole plate to be pivotable into and out of a plurality of positions, then the above desirable advantages may be met.

Preferably the body of the power saw defines two working 10 surfaces either of which may, during use of the power saw, abut a workpiece, and wherein the pivotable sole plate may be pivoted to rest against either of these two surfaces. If one of the working surfaces is used when the saw is in a panel saw mode, then the sole plate may abut the other 15 during use. Conversely, if the other working surface is used when the saw is in a jigsaw mode, the sole plate may abut the said one working surface. The pivotable sole plate may be lockable in any one of the plurality of positions.

20 In a preferred embodiment the body is shaped to define a recess within which the pivotable sole plate may sit when in at least one of the plurality of positions. This permits the sole plate to be kept out of the way of the user when desired during certain sawing operations. Also, the sole 25 plate may include visual indicia to act as a guide to align the power saw with a workpiece.

The present invention will now be described, by way of example only, and with reference to the accompanying 30 drawings, of which:-

Figure 1 shows a reciprocable shaft on which a saw blade may be mounted in accordance with an embodiment of the present invention;

Figure 2 shows the shaft of Figure 1, but with a saw blade mounted thereon in an operating position from one side; Figure 3 shows the view of Figure 2, but from the other side of the saw blade;

5

Figure 4 shows a side view of the reciprocable shaft of Figure 1, but with the retaining member thereof being in an unlocked position;

10 Figure 5 shows the shaft of Figure 1 with the saw blade mounted thereon in a locked position;

Figure 6 shows a sectional view along the line A-A of Figure 5;

15

Figure 7 shows a sectional view along the line B-B of Figure 5;

20 Figure 8 shows a side view of a saw blade and the reciprocable shaft of Figures 2 and 3 in an unlocked position;

Figure 9 shows the view of Figure 8, but with the saw blade now retained in its stored and locked position;

25

Figure 10 shows a schematic illustration of the motor and internal mechanisms of a power tool in accordance with an embodiment of the present invention;

30 Figure 11 shows a schematic side representation of Figure 10;

Figure 12 shows a side view of a powered saw in accordance with an embodiment of the present invention; and

35

Figure 13 shows a side view of an alternative use of a powered saw to that of Figure 12.

Referring firstly to Figure 1, there is shown a shaft (2) formed from pressed metal, such as steel, and having in the 5 centre thereof a yoke (4). One end of the shaft (2) is formed integrally with a depending retaining member, here a blade mount (6). The blade mount (6) comprises a restraining means, here two arms (8) which depend from the shaft (2). The blade mount further includes a pin (10) 10 which will be described in more detail below.

Referring now also to Figures 2 and 3, it can be seen that the shaft (2) is arranged to drive a saw blade (12) presented thereto and which is mounted on the blade mount 15 (6). It can be seen that the saw blade (12) has a shank (14) which has formed therein a hole (16) (see more clearly Figures 5, 8 and 9) for mounting the blade (12) on a lug (18) of the pin (10).

20 Referring now to Figure 4, it can be seen that the pin (10) comprises a head (20) formed on one side of the blade mount (6) and a lug (18) co-operating with the head (20) formed on the other side of the blade mount (6). The shape of the lug (18) is the same as that of the hole (16) formed in the 25 blade (12). This allows for the blade (12) to be mounted snugly on the lug (18).

The pin (10) is rotatable about its axis shown as X-X in Figure 4 and it can be seen from this figure that the blade 30 mount (6) has a recess (21) formed therein such that the lug (18) may sit within the recess (21) when it is in one of two positions. Because the pin (10) is rotatable about the axis X-X, then whenever the lug (18) is aligned with the recess (21) (in either of two positions 180° apart) then it will

fit within the recess (21). In any other position, the lug (18) cannot sit within the recess (21).

In order for the lug (18) to be selectively aligned or not  
5 with the recess (21), the head (20) of the pin (10) is  
spring biased. In this manner, therefore, whenever the lug  
(18) is aligned with the recess (21) it "pops" into the  
recess and is held therein until the user exerts sufficient  
10 force against the head (20) against the action of the spring  
(described later below) to force the lug (18) out of the  
recess (21) and therefore allow the pin (10) to be rotated  
about the axis X-X.

Referring now additionally to Figure 5, it can be seen that  
15 the saw blade (12) is held in its locked position (because  
the lug (18) is within the recess (21)) against the shaft  
(2). Because the shaft (2) is arranged to reciprocate, that  
is drive the blade (12) backwards and forwards along a  
linear path, then it will be understood that each of the  
20 arms (8) is arranged to flank the shank (14) of the blade  
(12) to prevent the blade (12) from becoming detached from  
the blade mount (6). This is because the arms (8) prevent  
any movement of the blade (12) in a direction perpendicular  
to the direction of reciprocation of the shaft (2).

25 In order to understand the operation of the pin (10) and its  
interaction with the blade (12), reference will now be made  
in particular to Figures 5, 6 and 7.

30 The pin (10) is spring biased, and in the case of Figure 6,  
it can be seen that the head (20) of the pin (10) has not  
been depressed and therefore under the action of the spring  
(22), the head (20) is forced to the left of Figure 6  
therefore allowing the lug (18) to sit within the recess  
35 (21). This does, of course, presuppose that the lug (18) is

aligned with the recess (21) as has been described here above. Assuming this to be the case, then the blade will be locked in this position. Rotation of the pin and therefore the lug (18) are not possible because the lug (18) is  
5 located within the housing (20).

Referring now to Figure 7, it will be described how the lug (18) is released from the recess (21) in order to allow rotation of the saw blade (12).

10 In Figure 7 the user has pushed the head (20) to the right of the figure and therefore caused compression of the spring (22). The movement of the pin (10) to the right of the figure releases the lug (18) from the recess (21) and  
15 therefore allows rotation of the pin (10) about its axis X-X. Because the lug (18) is now no longer located within the recess (21) then rotation of the pin (10) means that the blade (12) may be rotated as well. Referring also to Figure 8, this shows how the saw blade (12) has been rotated  
20 through 90° as compared with the locked position of Figure 5.

Whilst referring to Figure 8, it can be seen that, because the blade (12) is now perpendicular to the shaft (2) rather  
25 than parallel therewith as was the case in Figure 5, then the shank (14) of the saw blade (12) is no longer constrained by the arms (8) of the blade mount (6). This means that the entire blade (12) may be removed from the lug (18) and could, for example, be replaced by an alternative  
30 saw blade.

Referring now to Figure 9, it can be seen that further rotation of the pin (10) and the blade (12) is possible (because there is no alignment between the lug (18) and the  
35 recess (20)). The saw blade (12) as shown in Figure 9 has

now been rotated through 180° with respect to that of Figure 5. It will be appreciated that the lug (18) is now re-aligned with the recess (21) and therefore if the user ceases to apply any force to the head (20) of the pin (10),  
5 then the lug (18) may fall back into the recess (21) and therefore lock the saw blade (12) in the position shown. This may be useful when the saw is to be carried around but the blade needs to be kept safely within the body of the saw, for example, to avoid injuring a user or damage to the  
10 saw blade.

Although only shown in dotted outline in Figure 9, it will understood that a further pair of arms (8) may be employed in the blade mount (6) to retain the saw blade (12) in the  
15 position shown.

Referring now to Figures 10 and 11 particularly, the internal mechanism of the power tool embodying the present invention will be described. In these examples, the power  
20 tool is a power saw.

An electric motor (24) is operable in conventional manner to drive a motor spindle (26) coupled to a drive wheel (28). The teeth of the drive wheel (28) mesh with the teeth of a  
25 gear wheel (30) having formed thereon an eccentric (32). Although not shown in the drawings, the eccentric (32) must be counter-balanced and those skilled in the art will appreciate this fact.

30 The eccentric (32) fits into the yoke (4). In this way, when the motor (24) is activated, it drives the drive wheel (28) which in turn causes rotation of the gear wheel (30). The circular movement of the eccentric (32) sitting in the yoke (4) therefore causes a linear reciprocal motion of the  
35 shaft (2) in a right-left-right motion as the drawings are

- viewed. In order to ensure that the only motion of the shaft (2) at the operative end (that is where the blade (12) and the blade mount (6) are situated) occurs, a retaining bar (34) having linear bearings surrounds the shaft (2).
- 5 This restrains movement of the shaft only in the left-right-left linear direction.

Whilst in the above examples of Figures 10 and 11 only one drive wheel (28) is shown, those skilled in the art will  
10 appreciate that any desired gearing arrangement may be used. The choice of gearing arrangement will depend primarily on the step up/step down requirement between the rotational output speed of the motor (24) and the frequency of linear reciprocation needed for the shaft (2).

15 Referring now particularly to Figures 12 and 13, two further embodiments of the present invention are now described. It can be seen by comparing these two figures, that the power tools shown therein share the same body (36). However, the  
20 tools shown in Figures 12 and 13 each are used for a different purpose and operate in different modes, as will be described here below. It should be understood that, for the purposes of Figures 12 and 13, the internal mechanism as shown in Figures 10 and 11 is incorporated therein.  
25 However, because Figures 12 and 13 show the tool from the outside, then the internal mechanisms cannot be seen.

In Figure 12, the tool is used as a so-called panel saw. Panel saws are generally used for sawing large pieces of  
30 wood and the like in the form of blocks such as logs. In the present invention, it has been found desirable to be able to offer the user the facility of using the panel saw not only in its powered mode but also manually. That is, the user should be able to grip the handle (38) of the panel  
35 saw and use it as a conventional manually operated saw

whether the blade is being driven by the motor (24) or not. To achieve this the saw needs to be lightweight but also it has been found that, when the saw is being driven by the motor (24), conventional reciprocating action will prevent 5 manually using the tool with ease, because of the combination of the frequency of reciprocation of the saw blade (12) and the length of each reciprocal stroke.

Conventionally, it has been found that the frequency of 10 reciprocation of the blade (12) has been around 3,000 strokes per minute. Additionally, the length of each reciprocal stroke has been in the region of 20mm. The combination of this particular frequency and stroke length results in large vibrational forces being felt by the user. 15 Additionally, this creates large inertial forces which also need to be overcome in order to be able to use the saw manually. With a conventional panel saw, therefore, if the user wishes to use it manually rather than in its conventional powered mode, a degree of discomfort would be 20 felt because the saw would be vibrating at a frequency which does not lend itself to holding the saw comfortably. Additionally, the amplitude of each reciprocal stroke of the blade (12) is so large that high inertial forces are felt by the user mean that to be able to pull and push the saw in a 25 manual mode is not easily achievable.

It has been found that by reducing the length of each reciprocal stroke to preferably around 10mm and concomitantly increasing the reciprocal stroke frequency to 30 preferably around 6,500 strokes per minute, that this combination of lower stroke length and higher frequency results in less adverse vibrational and inertial forces being felt by the user. This then enables the panel saw of Figure 12 to be used as a manual saw simply by holding the 35 handle (38). Additionally, if the user requires a further

grip on the body (36), a recess, formed as insert (40) is available for gripping by the other hand of the user (that is the hand which does not grip the handle (38)).

- 5 Although in the example described with reference to Figure 12 the preferred frequency of oscillation has been given as 6,500 strokes per minute, the present invention has been found to operate effectively with a frequency of vibration between 3,000 and 10,000 strokes per minute. Similarly,
- 10 although the preferred amplitude of each reciprocal stroke is given as 10mm, it has been found that the present invention works effectively with a range of 5 to 15mm.

Referring now also to Figure 13, it can be seen that the same body (36) is used with a different saw blade (12). Indeed, the saw blade (12) is that found on conventional "jigsaws". Jigsaws are tools which are used with relatively small saw blades and are used for cutting accurate shapes in a workpiece. Conventionally, jigsaws are held relative to the workpiece in a different attitude to panel saws. This can be seen by reference to the difference in attitude between Figure 12 and 13. In Figure 13, the body (36) can be seen resting on a block (42) which represents a workpiece. In use of the jigsaw, the body (36) would be held on the block (42) in the attitude shown in Figure 13.

It can be seen from Figure 13 that the handle (38) is now positioned relative to the workpiece (42) such that the body (36) may easily be used as a jigsaw. In use of the jigsaw, a user exerts a force via the handle (38) in the direction of the large arrow marked "A". This is so that the blade (12) is driven also in the direction of the arrow "A" to cut through the workpiece.

It can be seen by comparing Figures 12 and 13, that the handle (38), although itself the same in both figures, is able to be used for exerting forces in a different direction depending on which mode of use (either the panel saw of 5 Figure 12 or the jigsaw of Figure 13) the tools are put to.

The handle (38) is positioned adjacent a trigger (44) which trigger (44) is operable by user when the handle (38) is gripped.

10 It can be seen from both Figures 12 and 13, therefore, that the position of the handle (38) relative to the body (36) is such that the user may operate the saw in a plurality of positions relative to a workpiece. Thus, regardless of 15 whether the tool is being used as a panel saw in Figure 12 or a jigsaw in Figure 13, the same handle is used for operating the saw. It will be appreciated by those skilled in the art, that this holds true whether the panel saw of Figure 12 is being used as a powered saw by powering the 20 motor (24) via an electricity supply cable (46), or whether it is being used manually.

In the examples shown, the trigger (44) is formed integrally with the handle (38). This need not necessarily be the 25 case, and the trigger may be formed separately or indeed on another part of the body (36).

From Figures 12 and 13, therefore, it can be seen that the handle (38) is accessible from one of two sides, depending 30 on whether the tool is to be used as a panel saw or a jigsaw. It is envisaged that the present invention is of scope to allow more than two sides of the handle (38) to be used depending on the purpose to which the tool is being put.

It can be seen from Figures 12 and 13, that the body (36) also includes a pivotable sole plate (48). The sole plate (48) is pivotable about pivot point (50). The pivot point (50) includes a means (not shown) for allowing the sole 5 plate (48) to be held at any one of a desired position around the range of possible pivotable positions about the point (50). In the example of Figure 12, the sole plate (48) is tucked underneath the body (36). In the example of Figure 13, the sole plate (48) is pivoted through 270° so as 10 to act as the guide sole plate for a conventional jigsaw. In this mode, the blade (12) passes through the sole plate (48) when used in its jigsaw mode.

Those skilled in the art will appreciate that, 15 conventionally, jigsaws use a sole plate (48) to act as a guide when cutting a workpiece. In the example of Figure 13, although it cannot be seen from the drawing, the sole plate (48) includes visual indicia to allow the user to see exactly where the blade (12) will cut the workpiece when 20 viewed from above the body (36).

It can be seen by comparing Figures 12 and 13, therefore, that the body (36) defines two working surfaces (52 and 54) dependent upon which mode the tool is being used. In the examples above, working surface (52) is used for the jigsaw 25 mode of Figure 13 and working surface (54) is used for the panel saw mode of Figure 12.

It will be understood by those skilled in the art that the sole plate (48) may be positioned at any suitable angle 30 relevant to the body (36) dependent upon the use to which the tool is being put.

By referring now particularly to Figure 13 it can be seen that, when the tool is used as a jigsaw, a user may also 35 grip the dimpled surface (56) in order to assist with

guiding the tool during use. Alternatively, this surface (56) can be used to form cooling vents within the body of the saw.

## CLAIMS

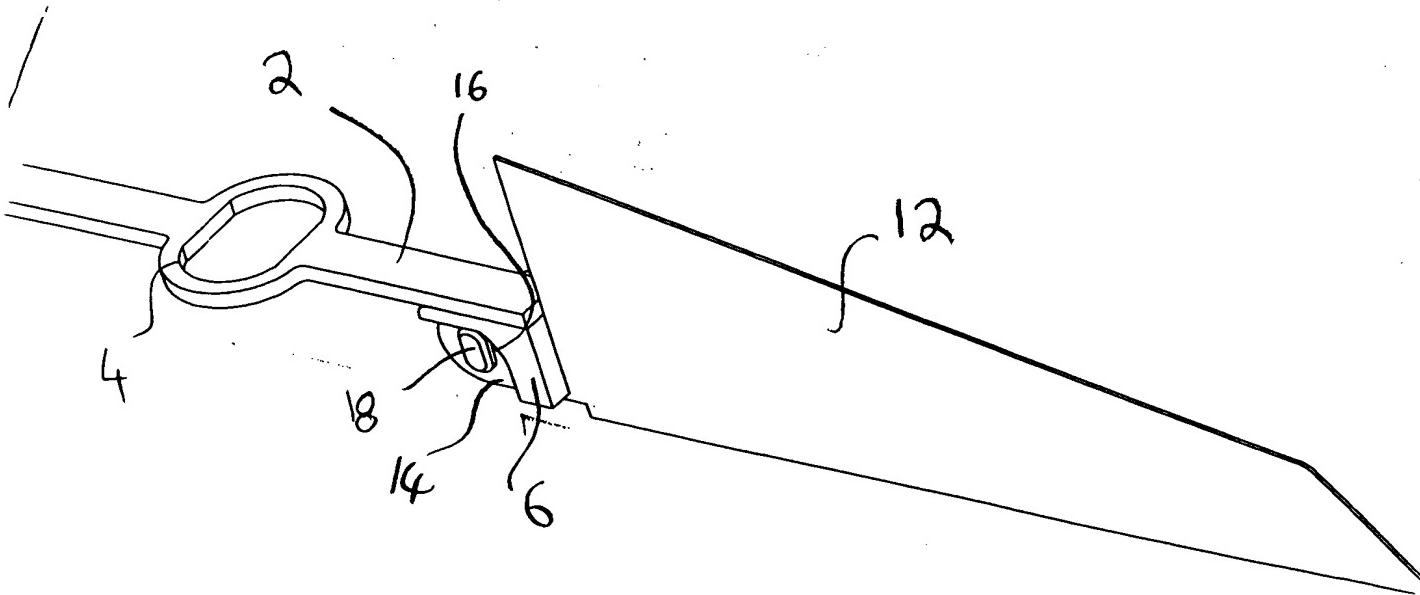
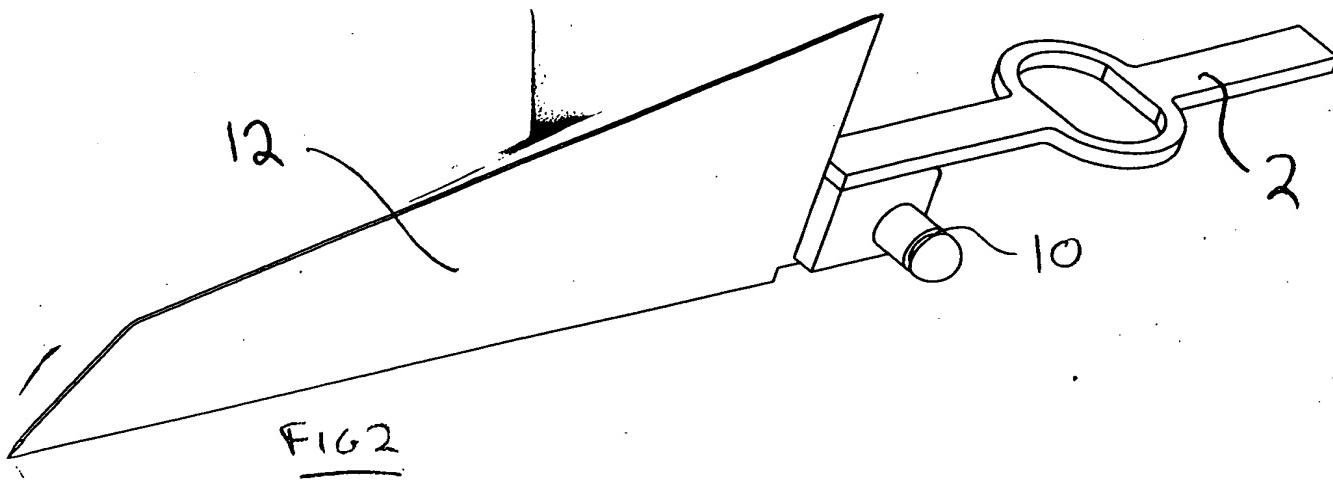
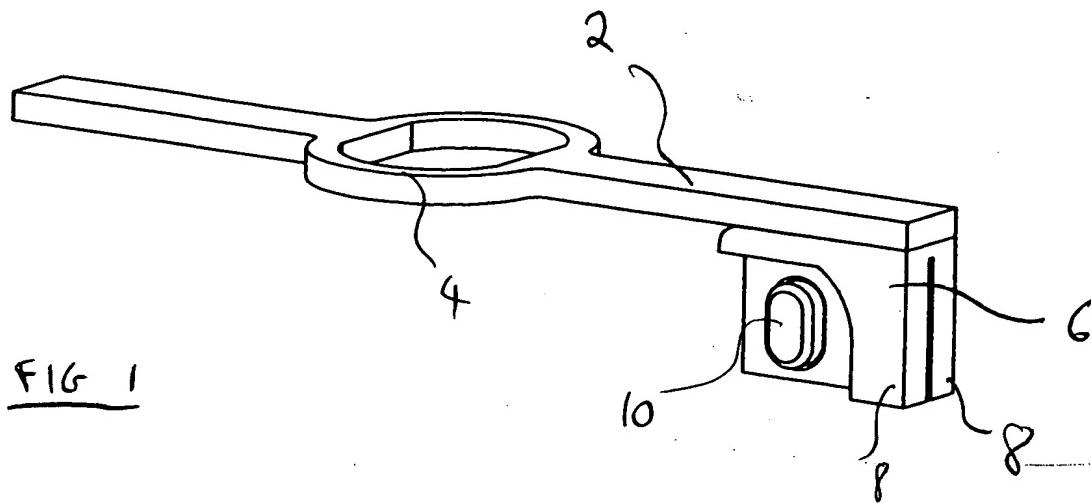
1. A power saw including: a body and a motor housed within the body; the motor arranged to power a reciprocable shaft on which a blade for sawing may be mounted; a pivotable sole plate attached to the body and arranged to be held relative thereto in a plurality of positions such that in at least one position the sole plate acts as a guide for use of the power saw as a jigsaw with the blade for sawing passing through the sole plate in use of the power saw as a jigsaw.
2. A power saw according to claim 1, wherein the body of the power saw defines two working surfaces either of which may, during use of the power saw, abut a workpiece, and wherein the pivotable sole plate may be pivoted to rest against either of these two surfaces.
3. A power saw according to either claim 1 or claim 2 wherein the pivotable sole plate is lockable in any one of the plurality of positions.
4. A power saw according to any one of the preceding claims, wherein the body is shaped to define a recess within which the pivotable sole plate may sit when in at least one of the plurality of positions.
5. A power saw according to any one of the preceding claims, wherein the pivotable sole plate includes visual indicia to act as a guide to align the power saw with a workpiece.
6. A power saw substantially as hereinbefore described and with reference to the accompanying drawings.

## ABSTRACT

## A POWER SAW

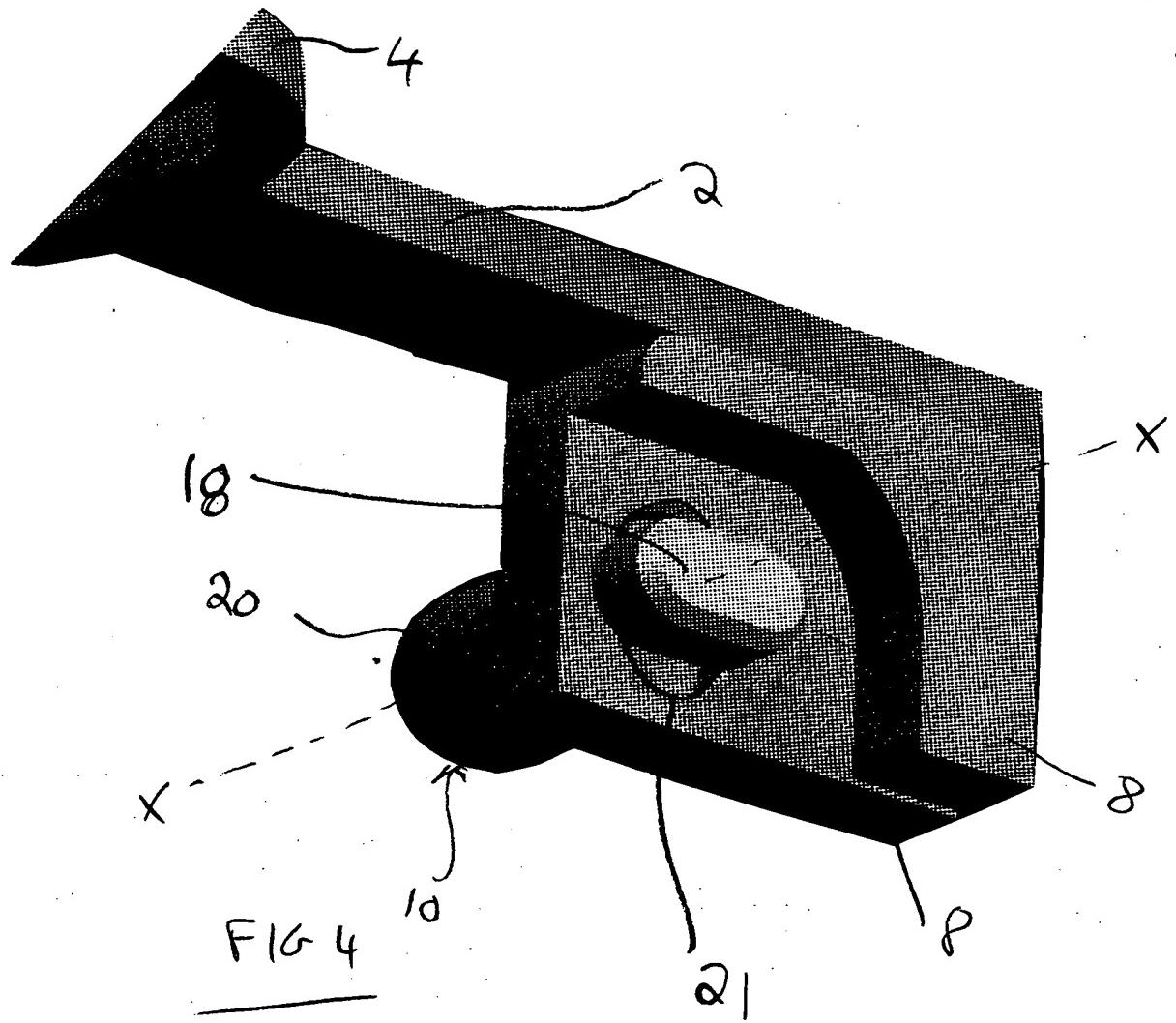
- 5 A power saw includes a body (36) housing a motor (24). The  
motor drives a reciprocal shaft (2) on which a blade (12) is  
mounted. The body is coupled to a pivotable sole plate  
(48,50) which is held relative to the body (36) in a  
plurality of positions such that in at least one position  
10 the sole plate may act as a guide for use of the tool as a  
jigsaw.

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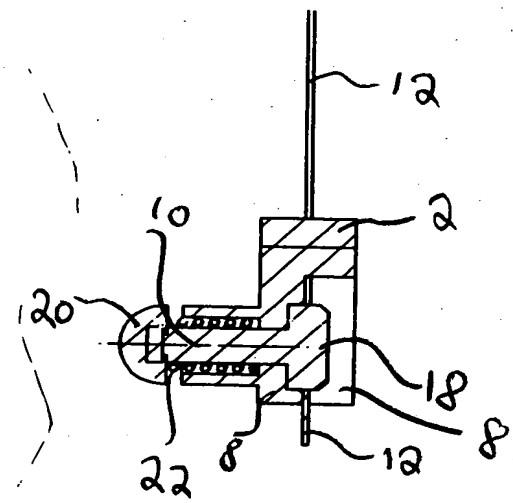
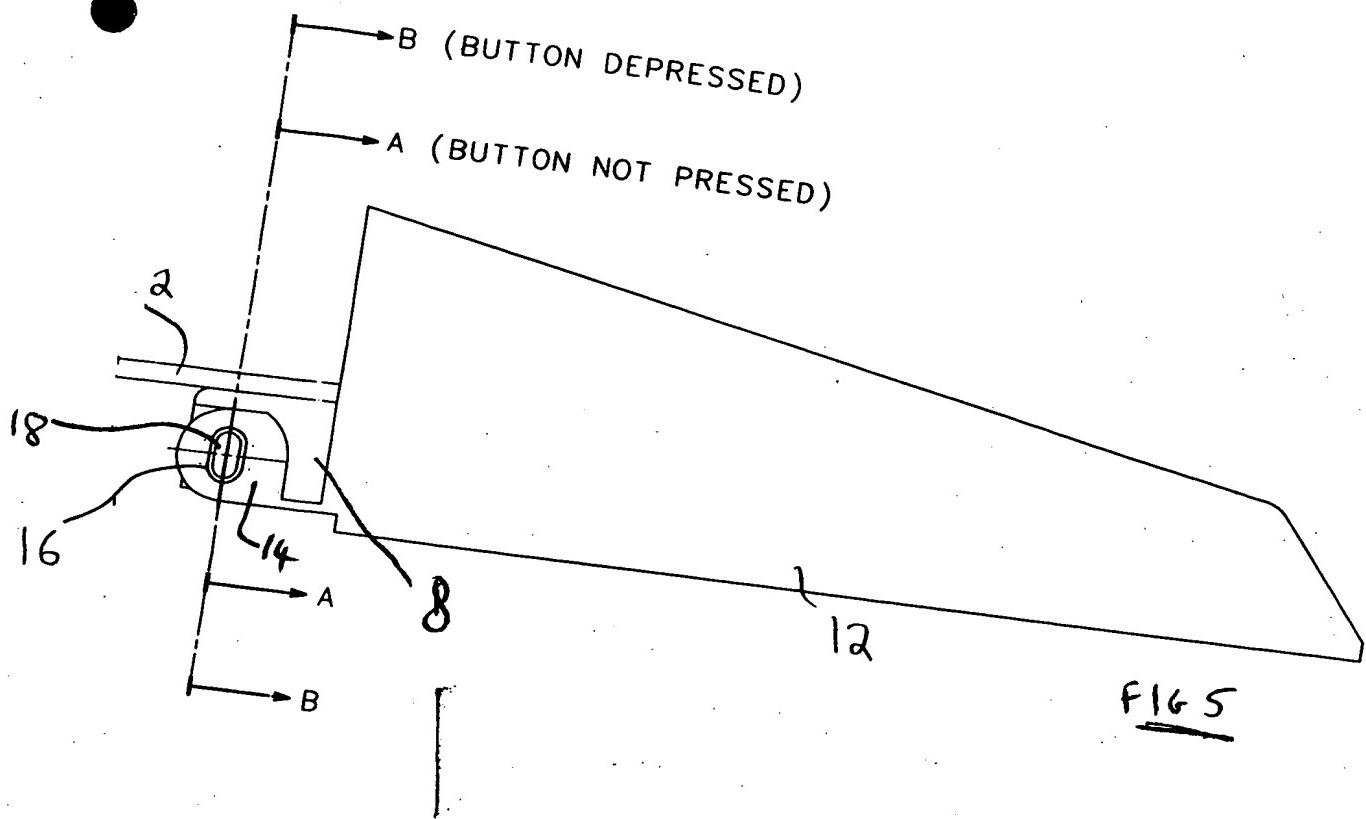


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FIG 6

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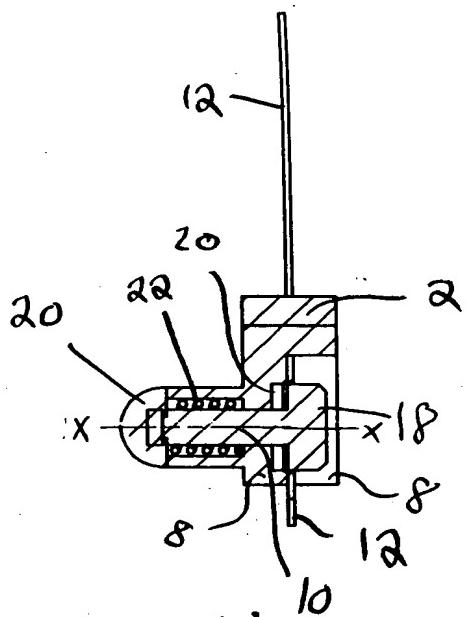


FIG 7.

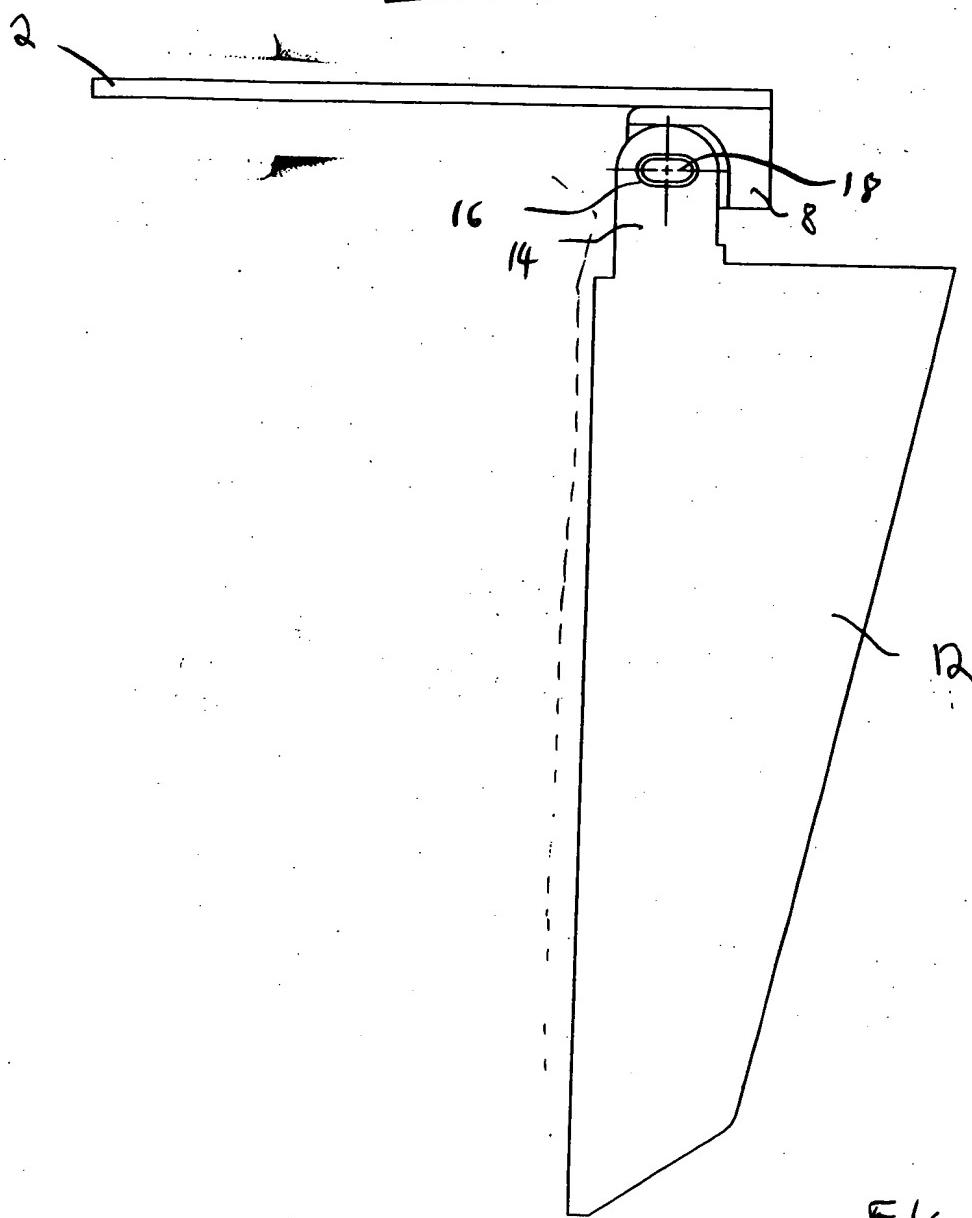


FIG 8

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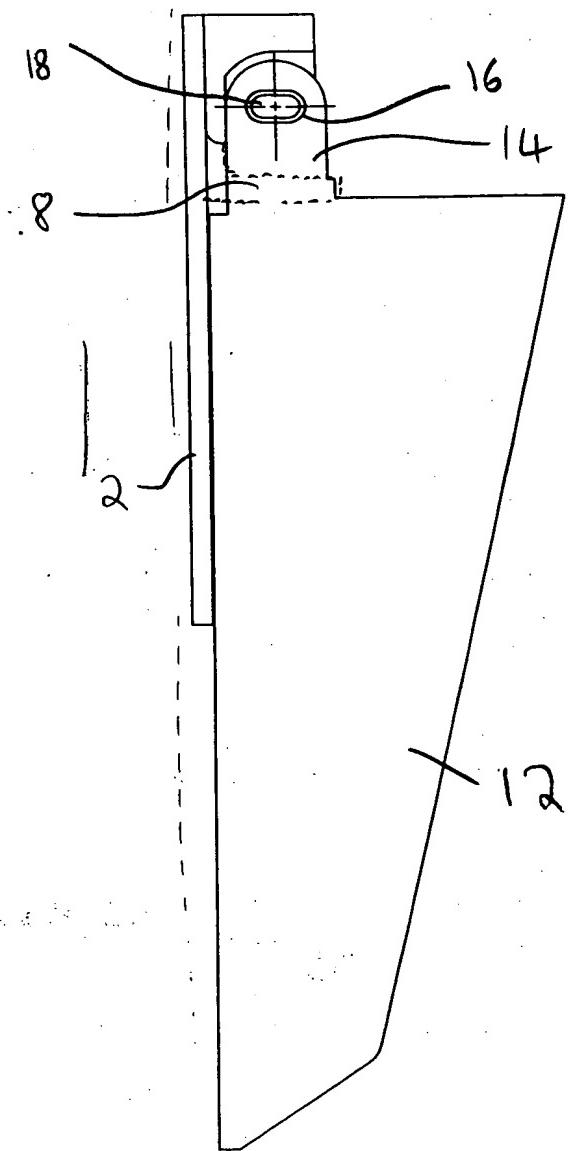


FIG 9

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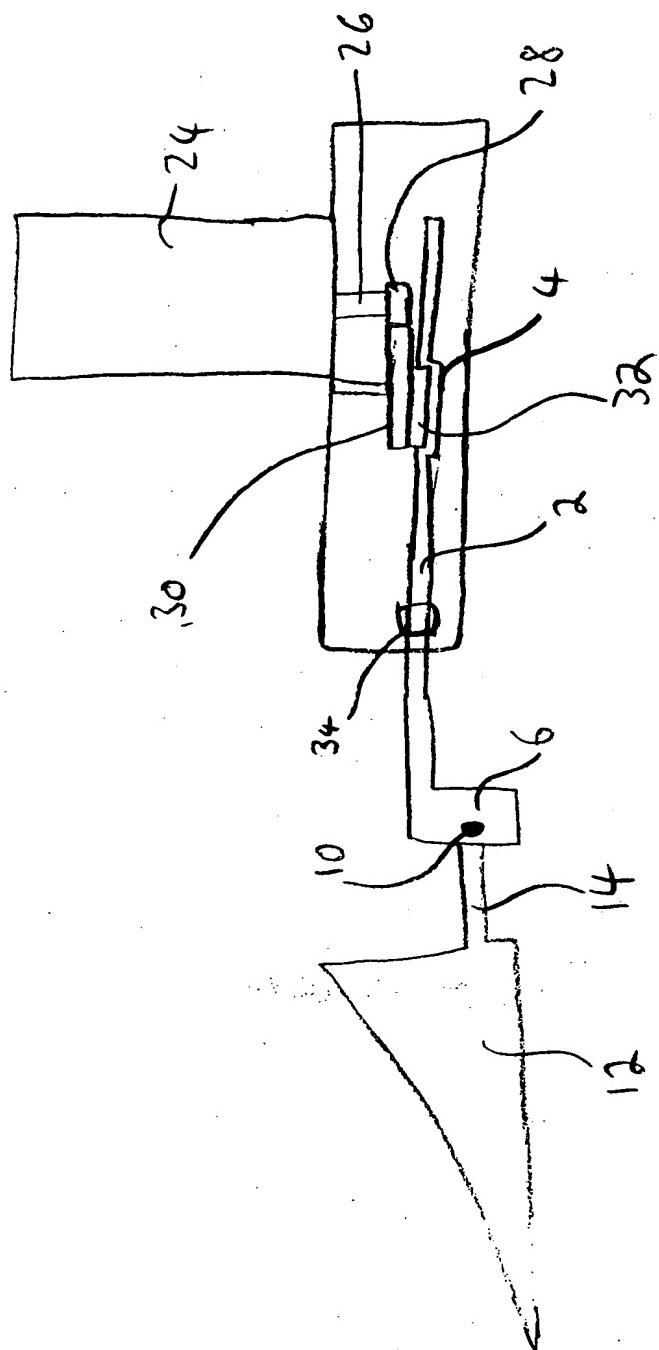


FIG 10

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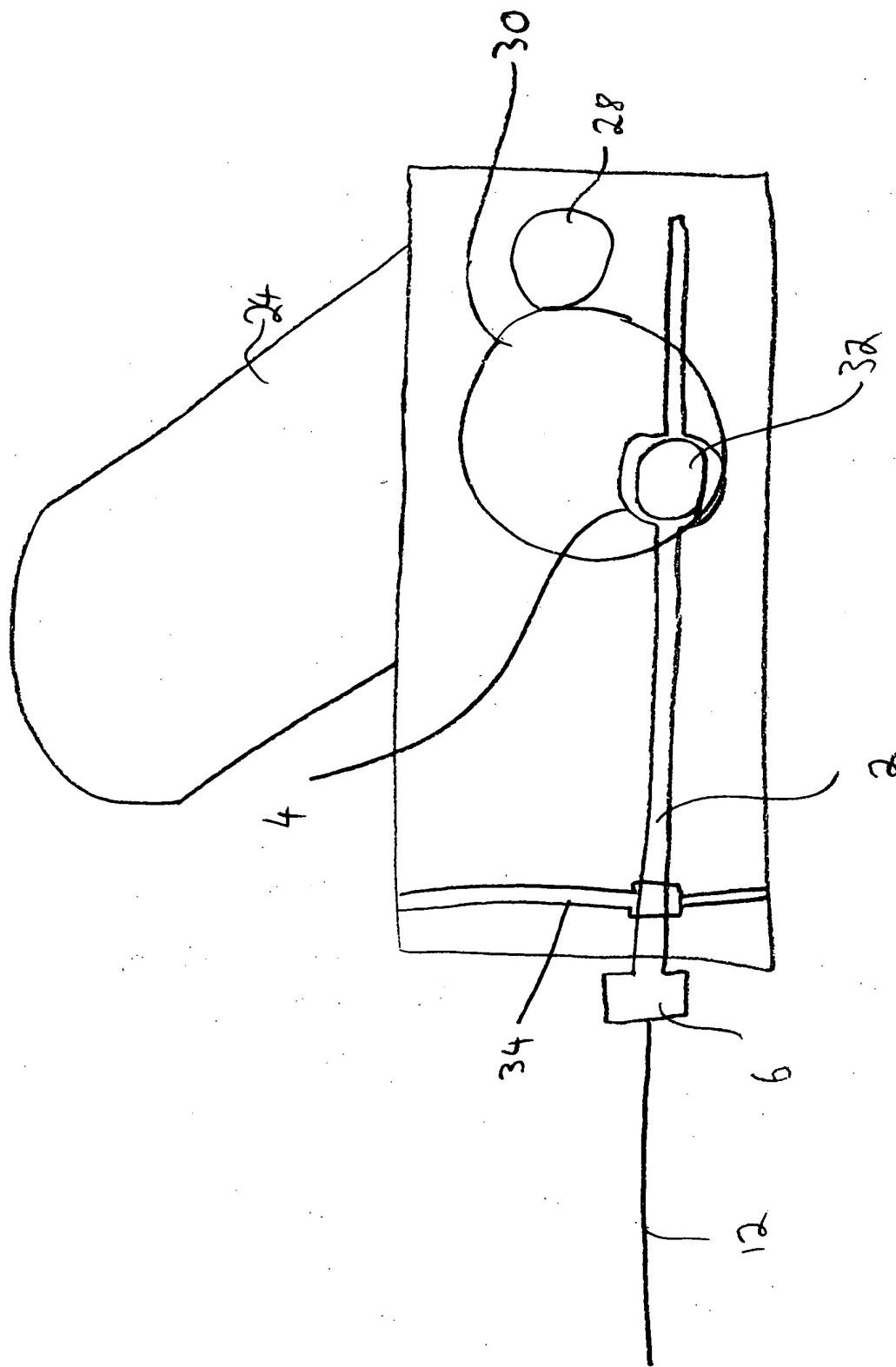


FIG 11

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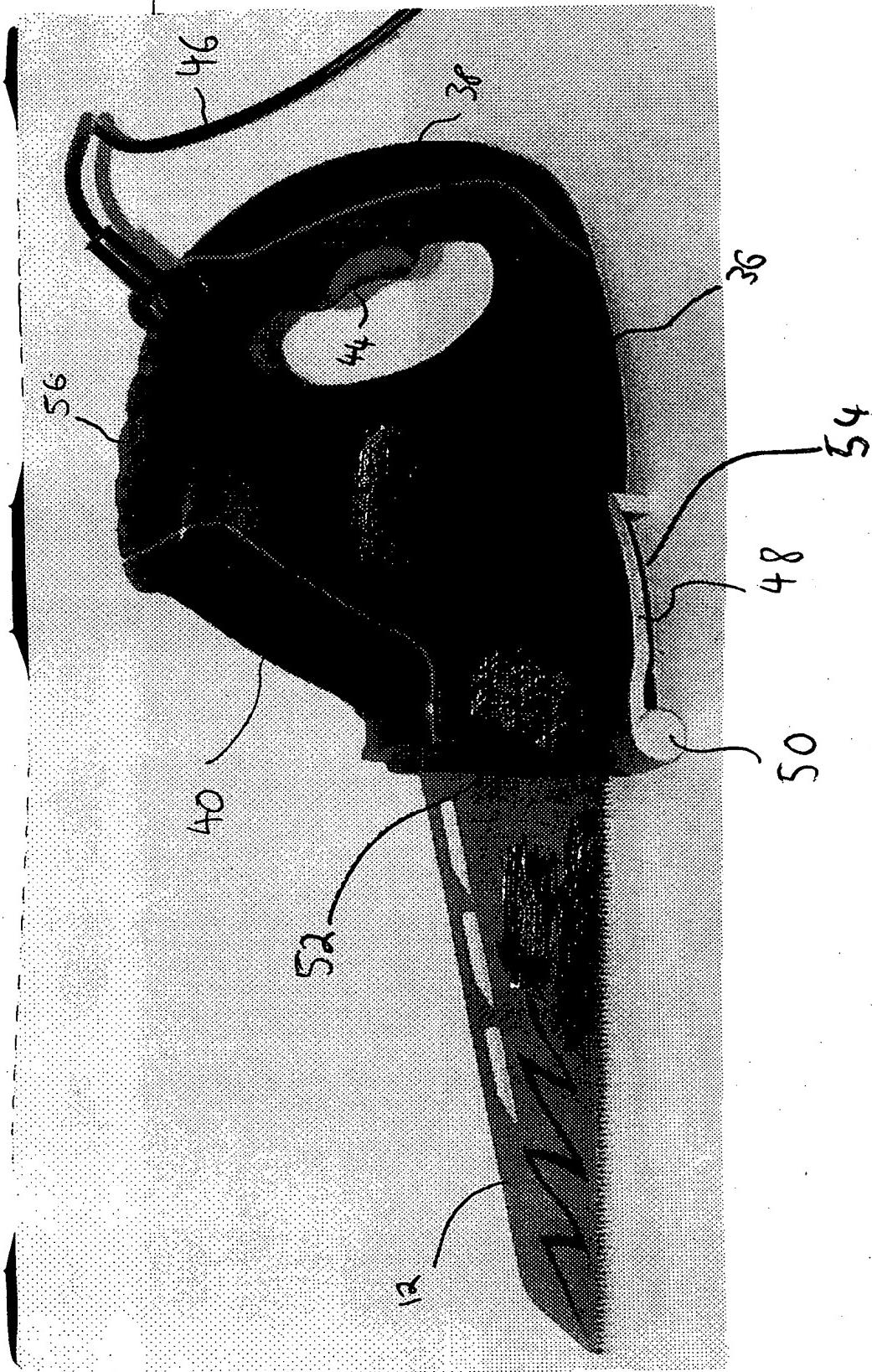


FIG 12

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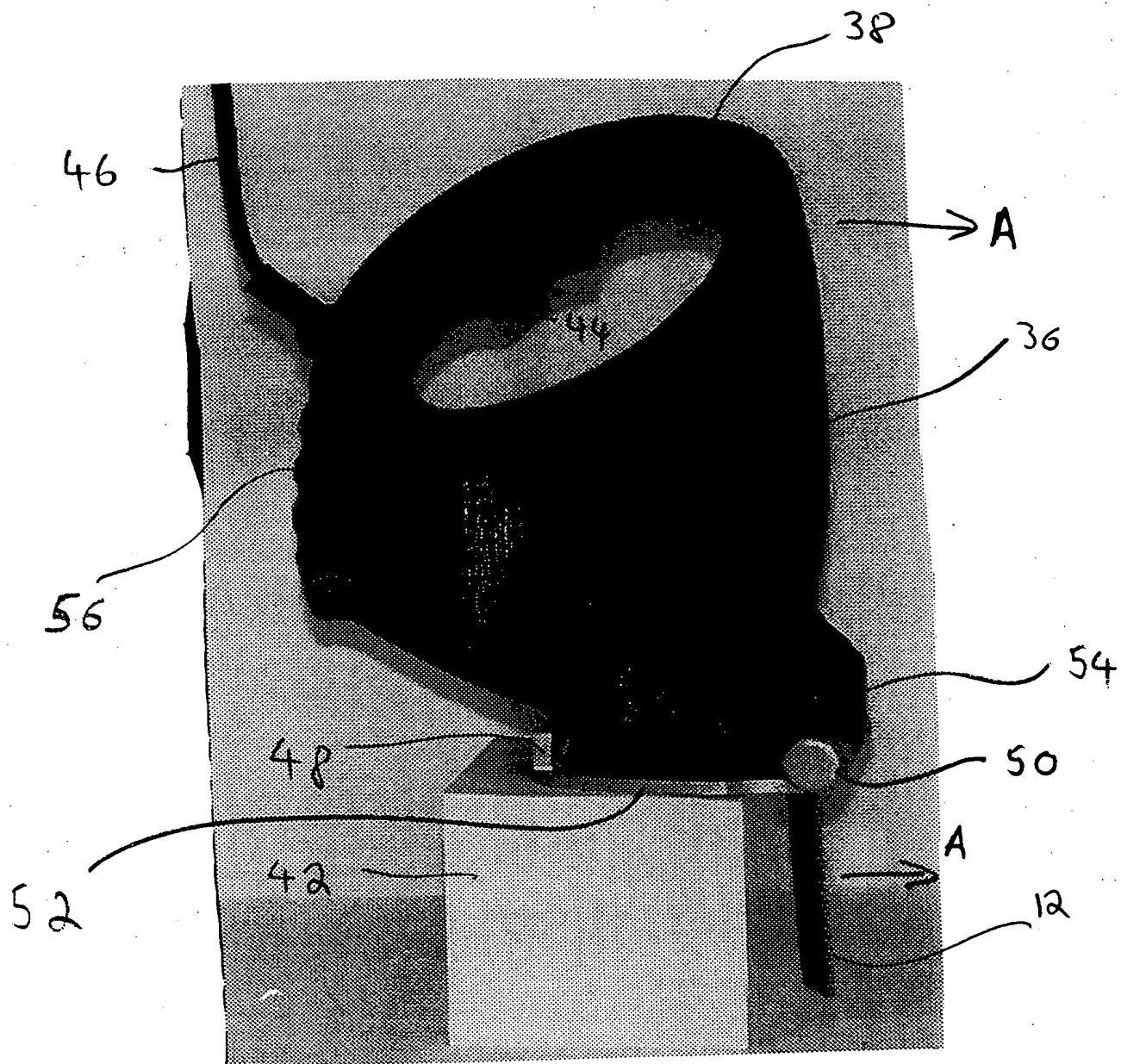


FIG 13

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